THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1-3 (Canceled)

4. (Currently Amended) A photoelectric conversion device having a layered structure, said layered structure comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer, [[and]]

said carrier generation/multiplication layer is prevented from holes flowing out thereof, and is prevented from electron injection thereto, and

a composition ratio C/Si of said electron injection inhibiting layer is adjusted appropriately to 1.5 or lower.

5. (Previously Presented) The photoelectric conversion device as claimed in claim 6, wherein a composition ratio N/Si of said hole injection inhibiting layer is adjusted appropriately to 0.8 or lower.

6. (Previously Presented) A photoelectric conversion device having a layered structure, said layered structure comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer, and

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side.

7. (Previously Presented) A photoelectric conversion device having a layered structure, said layered structure comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer,

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side, and

said carrier generation /multiplication layer is prevented from electron flowing out thereof, and is prevented from hole injection thereto.

8. (Currently Amended) The photoelectric conversion device as claimed in claim [[1]] 4, wherein said layer structure is formed on a surface of a substrate having at least said surface composed of polycrystalline silicon.

9. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein said layer structure is formed on a surface of a substrate having at least said surface composed of microcrystalline silicon.

10. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein said layer structure is formed on a surface of a substrate having at least said surface composed of monocrystalline silicon.

11. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein said layer structure is formed on a surface of a substrate having at least said surface composed of a metal.

12. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein a small amount of boron is introduced into said carrier generation/multiplication layer.

13. (Previously Presented) A photoelectric conversion device having a layered structure, said layered structure comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer, and

said layer structure further comprises an electric field reducing layer for reducing an electric field adjacent an interface between said carrier generation/multiplication layer and said electron injection inhibiting layer.

14. (Previously Presented) A photoelectric conversion device having a layered structure, said layered structure comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer, and

said layer structure further comprises an electric field reducing layer for reducing an electric field adjacent an interface between said carrier generation/multiplication layer and said hole injection inhibiting layer.

15. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein said layer structure consists of said carrier generation/multiplication layer, said electron injection inhibiting layer, and said hole injection inhibiting layer.

16. (Previously Presented) A solid-state image sensing device comprising:

a plurality of photoelectric conversion units, each photoelectric conversion unit having a layered structure and including:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and the function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer, and

an energy level at an interface between said amorphous silicon carbide layer and said amorphous silicon layer is discontinued on a conduction band side and equal on a valence band side;

a plurality of accumulation units for respectively accumulating charges generated by said photoelectric conversion units; and

an output unit for outputting the charges accumulated in said accumulation units.

17. (Previously Presented) The solid-state image sensing device as claimed in claim 25, wherein a composition ratio C/Si of said electron injection inhibiting layer is adjusted appropriately to 1.5 or lower.

18. (Previously Presented) The solid-state image sensing device as claimed in claim 26, wherein a composition ration N/Si of said hole injection inhibiting layer is adjusted appropriately to 0.8 or lower.

19. (Previously Presented) A solid-state image sensing device comprising:

a plurality of photoelectric conversion units, each of which comprising:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers

through optical excitation and function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer;

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer; and

an electric field reducing layer for reducing an electric field adjacent an interface between said carrier generation/multiplication layer and said hole injection inhibiting layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer;

a plurality of accumulation units for respectively accumulating charges generated by said photoelectric conversion units; and

an output unit for outputting the charges accumulated in said accumulation units.

20. (Previously Presented) The solid-state image sensing as claimed in claim 16, wherein said layer structure consists of said carrier generation/multiplication layer, said electron injection inhibiting layer, and said hole injection inhibiting layer.

21. (Currently Amended) A photoelectric conversion device having a layered structure, said layered structure comprising:

an substrate layer;

a hole injection inhibiting layer formed on only said substrate;

a carrier generation/multiplication layer formed on said hole injection inhibiting layer; and

an electron injection inhibiting layer formed on said carrier generation/multiplication layer; wherein

said carrier generation/multiplication layer is composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer,

said hole injection inhibiting layer is composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, [[and]]

said electron injection inhibiting layer is composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer, and

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side.

22. (Currently Amended) A solid-state image sensing device comprising:

a plurality of photoelectric conversion units, each photoelectric conversion unit including:

a substrate;

a hole injection inhibiting layer formed on only said substrate;

a carrier generation/multiplication layer formed on said hole injection inhibiting layer; and

an electron injection inhibiting layer formed on said carrier generation/multiplication layer; wherein

said carrier generation/multiplication layer is composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer,

said hole injection inhibiting layer is composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, [[and]]

said electron injection inhibiting layer is composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer, and

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side;

a plurality of accumulation units for respectively accumulating charges generated by said photoelectric conversion units; and

an output unit for outputting the charges accumulated in said accumulation units.

23. (Previously Presented) The photoelectric conversion device as claimed in claim 7, wherein a composition ratio N/Si of said hole injection inhibiting layer is adjusted appropriately to 0.8 or lower.

24. (Canceled)

25. (Previously Presented) A solid-state image sensing device comprising:

a plurality of photoelectric conversion units, each photoelectric conversion unit including:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and the function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer;

a plurality of accumulation units for respectively accumulating charges generated by said photoelectric conversion units; and

an output unit for outputting the charges accumulated in said accumulation units, wherein

said carrier generation/multiplication layer is prevented from holes flowing out thereof, and is prevented from electron injection thereto, and

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side.

26. (Previously Presented) A solid-state image sensing device comprising:

a plurality of photoelectric conversion units, each photoelectric conversion unit having a layered structure and including:

a carrier generation/multiplication layer composed of amorphous silicon to have both the function of absorbing light and generating carriers through optical excitation and the function of multiplying the generated carriers;

an electron injection inhibiting layer composed of an amorphous silicon carbide of the p-type conductivity to inhibit injection of electrons into the carrier generation/multiplication layer; and

a hole injection inhibiting layer composed of amorphous silicon nitride of the n-type conductivity to inhibit injection of holes into the carrier generation/multiplication layer, wherein

said carrier generation/multiplication layer is provided between said electron injection inhibiting layer and said hole injection inhibiting layer;

a plurality of accumulation units for respectively accumulating charges generated by said photoelectric conversion units; and

an output unit for outputting the charges accumulated in said accumulation units, wherein

said carrier generation /multiplication layer is prevented from electron flowing out thereof, and is prevented from hole injection thereto, and

an energy level at an interface between said amorphous silicon nitride layer and said amorphous silicon layer is discontinued on a valance band side and equal on a conduction band side.

27. (Canceled)

28. (Previously Presented) The photoelectric conversion device as claimed in claim 4, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

29. (Previously Presented) The photoelectric conversion device as claimed in claim 6, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

30. (Previously Presented) The photoelectric conversion device as claimed in claim 7, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

31. (Previously Presented) The photoelectric conversion device as claimed in claim 13, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

32. (Previously Presented) The photoelectric conversion device as claimed in claim 14, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

33. (Previously Presented) The solid-state image sensing device as claimed in claim 16, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

34. (Previously Presented) The solid-state image sensing device as claimed in claim 19, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

35. (Previously Presented) The photoelectric conversion device as claimed in claim 21, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

36. (Previously Presented) The solid-state image sensing device as claimed in claim 22 wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

37. (Previously Presented) The solid-state image sensing device as claimed in claim 25, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.

38. (Previously Presented) The solid-state image sensing device as claimed in claim 26, wherein the amorphous silicon nitride of the n-type conductivity is hydrogenated amorphous silicon nitride of the n-type conductivity.